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ABSTRACT

This report presents preliminary findings concerning the utility and validity of a new fuzzy matrix procedure for the measurement and identification of leader emergence and hierarchical structure of leadership in small groups. The instrument was designed to reflect the interactive, perceptual and shared nature of leadership. Several leadership identification techniques were reviewed, noting their inherent problems. Results from the pilot test demonstrated the utility of the fuzzy measurement procedure, its advantages over rank order measurement, and its ability to extract higher information levels about the structure and emergence of leadership. Several lines of research using this new measurement technique are explored in conjunction with consensus, coalition, and behavioral interactions in small-group research. (Author/PL)

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AN INTERACTIVE, PERCEPTUAL AND SHARED PERSPECTIVE ON LEADERSHIP:

DEVELOPMENT OF A FUZZY MEASUREMENT PROCEDURE*

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ABSTRACT

This study reported preliminary findings concerning the utility and validity of a new fuzzy matrix procedure for the measurement and identification of leader emergence and hierarchical structure of leadership in small groups. The instrument was designed to reflect the interactive, perceptual and shared nature of leadership. Several leadership identification techniques were reviewed, but problems were found to be inherent both conceptually and methodologically with most existing measurement procedures. Results from this pilot test demonstrated the utility of the fuzzy measurement procedure. Several advantages were explored for this new identification and measurement technique. Results demonstrated that a higher level of information could be obtained regarding the structure and emergence of leadership. Several lines of research using this new measurement technique were explored in conjuction with consensus, coalition, and behavioral interactions in small group research.

AN INTERACTIVE, PERCEPTUAL AND SHARED PERSPECTIVE ON LEADERSHIP: DEVELOPMENT OF A FUZZY MEASUREMENT PROCEDURE

The question of what makes a leader has been addressed by rhetoricians, sociologists, psychologists, communication theorists and by researchers of several interrelated disciplines. Conceptually, most present researchers view leadership as an interactive phenomenan which emerges as a result of a growing relationship among members of a social system. Methodologically, leadership has been measured in terms of pereeptions, behaviors, and qualities. A consensus on the exact nature of leadership emergence and leadership identification has not yet been achieved despite the wide varieties of studies. The purpose of this paper is to explore the utility of a new method of leadership identification based on the fuzzy set theory of mathematics (Spillman, Spillman, & Bezdek, 1977).

The first section of this paper will explore some current conceptual and measurement issues related to leadership. The second section will describe the assumptions and operational procedures for a new method of leader identification. The third section will explore results and implications from a pilot study designed to test the validity and utility of the fuzzy measurement procedure.

Leadership: Conceptual and Measurement Issues

Conceptual Issues

Three assumptions have guided most research on leadership within the last two decades. While not always adapted into experimental procedures, most researchers assume first that leadership is an interactive relationship between a "leader" and "followers" in a group. Lashbrook summarized this notion as follows:

> The behavioral expectations are expressed through the interaction among group members and are determined by member perceptions of each

> individual's attributes and performance, the situation, the task, and other related variables (1974, 308).

Lashbrook and Lashbrook emphasized the interactive character of leadership, and also noted that leadership depends upon group and situational requirements.

> ... we consider the acquisition and maintainance of a leadership role to be determined by group member interaction. That is, the role of leader in a group is not determined by personal qualities in the abstract, but by the individual's standing in relation to fellow group members in terms of the special qualities required by a particular group goal or situation (1975, 1).

The second assumption is that group leadership is defined both in the behaviors and the perceptions of those behaviors. Bales and Slater (1955) have noted that task and social leaders use certain types of behaviors more than nonleaders. Social leaders, for example, do more things to reduce tension than task or nonleaders. Task leaders, on the other hand, offer more suggestions, information and opinions than nonleaders. Stein (1975) found that emergent leaders in small groups are characterized by patterns of verbal and nonverbal cues. While amount of interaction did not distinguish leaders from nonleaders, he found that observers were able to discriminate leaders from nonleaders by their verbal and nonverbal performances. Based upon Gouran's (1969) work on orientation behavior (resolving conflict, encouraging participation, supporting agreements leading to consensus) were perceived as leaders significantly more often than group members engaging in no or low orientation behavior. Stein (1975) also noted that the behavior which distinguishes leaders from nonleaders may vary from group to group. Behaviors alone, however, have not proven to be a clean method for distinguishing leaders from nonleaders. According to Stein (1975) the failure of previous studies to find a direct relationship between frequencies of certain types of behaviors and leader vs. nonleader roles may be explained by the fact that group member ratings may be based upon the interpretations or evaluations of behavior rather than the dominance of a type of behavior.

The functional approach to leadership provides further theoretical backing for Stein's assumption. Giving information sounds like leadership in the abstract, but if the need for the group is for opinions or summaries, then the information-giving function will not be perceived as strong leadership by group members.

The third assumption is that leadership is a shared phenomenon. Fisher (1974) emphasized that since leadership involves the performance of certain behaviors which in combination with others lead the group toward its goal, anyone in the group may perform behaviors that might be characterized as leadership at any given point in time. This being the case, it is more accurate to conceptualize leadership as a hierarchy in which all members exhibit leadership qualities and behaviors to varying degrees than to conceptualize it as an all-or-nothing phenomenon with zero sum game components. For this paper, we have adopted the view of leadership proposed by Stein, Geis and Damarin.

> From the point of view of either Hollander's idiosyncratic theory of emergent leadership or of Bales' functional approach to group interaction, the taped group members' evaluation of one another's leadership behavior should be used to identify the leadership hierarchies. According to both theories, group members have leadership status to the extent that the group reguards them as its leaders. There is not just one leader in each group; all the members are viewed as making contributions which affect the group's activity to various extents (1973, 78).

Measurement and Identification Issues

Several measurement approaches have been used to identify leaders. The simplest technique has been to ask the group to name its leader. The person named most often is assumed to be the leader (Scioli, Dyson and Fleitas, 1974 and Marak, 1964). Although this technique has the advantage of simplicity and directness, it violates the assumption that all members carry out leadership functions and are therefore group leaders to differing degrees. Another approach to leadership identification has been to designate one person to carry out that role (Keely, 1975). While this is sometimes helpful for research which requires the use of

experimental control, researchers have demonstrated that unless an assigned leader fulfills group needs and goal requirements, he/she will lose his/her leadership role either directly or indirectly as other members step in to perform the necessary tasks or socially-related functions (Fisher, 1974).

Another method for identifying leaders has been to determine the person in the group who sends the most communicative messages (Lashbrook, 1974). While This approach is intuitively appealing, but it suffers from several major problems: (1) Stein (1975) has demonstrated that quantity of participation does not distinguish leaders from nonleaders. Perception of the behaviors rather than the amount of participation was a better leadership indicater. (2) The approach assumes a single leader perspective which contradicts the theoretical predictions and findings of functional theorists. (3) The method does not take into account members' perceptions reguarding the performance of leadership roles in groups.

Another identification procedure which more closely reflects the shared leadership principle has been to ask members to rank order group members from the most to the least important leader. All members are used in this ranking procedure (Katz, 1977). The problems with this measurement procedure lie with the inherent problems common to all ordinal measuring instruments. The distances between rankings are unknown and a pairwise comparison of each member to all other members is not produced.

Summary

To summarize, leadership is considered to be an interactive process based on the behaviors and perceptions of those behaviors by all group members. It is an emergent and shared process whereby all members of a group share the leadership role to varying degrees by virtue of their performance of need-satisfying and goal-oriented functions. The behaviors themselves are important, but their interpretation and evaluation by individual group members is critical for the

identification of leaders. The evaluation and perception of behaviors will depend not only upon the different performances of individual group members, but the situation, goal, and frames of references of other group members.

Most current instruments for measuring leadership violate one or all of these assumptions. The single leader approach, leader designation approach, quantification of high participation approaches, and the rank order approach all result in a partial picture of the emergence of leaders. What is needed is a measurement approach which will overcome some of these problems. The next section will explore an instrument intended to do just that.

The Fuzzy Measurement of Leadership

The description of leadership in terms of leader-follower interaction, perceptions, and shared responsibility can be characterized conceptually and analytically by the mathematics of fuzzy sets developed by Zadeh (1965).

In classical set theory given a set A and an element a_i, then a_i is either a member of the set A or it is not. This is represented by the characteristic function of the set A given by:

$$\mu_A(a_i) = \begin{cases} 1 & \text{if } a_i \text{ is a member of the set A} \\ 0 & \text{if } a_i \text{ is not a member of the set A} \end{cases}$$

Thus the characteristic function of the conventional set has two possible values, zero and one. Fuzzy sets generalize the notion of the characteristic function, allowing it to assume any value between zero and one so that an element a_i could be a partial member of the fuzzy set A'. In other words, it could possess some but not necessarily all the characteristics of the prototypical members of the set A'.

Consider leadership a set. According to the traditional single leadership perspective, a member who has been labelled a leader would have a membership of 1.0 in the leadership set while all others in ghe group would have a membership

value of 0.0 in this set. In a fuzzy set characterization of leadership, every member of the group would be assigned a membership value between 0.0 and 1.0 in the leadership set. If a group member performs nearly all the leadership functions all of the time, that member might be assigned a membership value of 1.0 indicating that he/she is the single most important leader in that group. A person who performs many leadership functions but also performs nonleader type behaviors might be assigned a .9 or .8 membership value. At the opposite extreme, a group member who virtually never performs a leadership function might be assigned a 0.0 membership value and a person who seldom but occasionally performs relevant goal-directed behavior might be assigned a .1 or .2 membership value in the leadership fuzzy set.

Thus, the characterization of leadership in fuzzy set terms allows for the identification of more than one leader in a group. It also allows for an examination of an emergent leadership hierarchy.

Extending the fuzzy set characterization allows for an examination of the interactive development of leadership. While rank ordering procedures allow an investigator to obtain information about the relative degrees of leadership among group members, a fuzzy matrix scaling procedure developed in previous research for the measurement of consensus and coalitions can be adapted to provide more complex information about the structure of leadership (Bezdek, Spillman and Spillman, 1977; Spillman, Spillman and Bezdek, 1977; Spillman, Bezdek and Spillman, 1978).

This procedure requires the development of a leadership matrix structured so that each member of the group is paired against all other members of the group (see figure 1). Individuals rate the members labeled in the column over the members labeled in the row on the degree of relative leadership displayed by each. If the person in the column is extremely strong relative to the person labeled by the row, a .9 or 1.0 would be entered into

the appropriate cell. If the person in the column is extremely weak relative to the person in the row, a .1 or 0.0 would be placed in the appropriate cell. If the two comparison persons are equal in the performance of leadership functions, a .5 would be entered into the appropriate cell.

For a clearer visualization of the leadership matrix see figure 2. As can be seen in the leadership matrix, Wendy appears to be a stronger leader than Bob (value of .2 in the matrix). Wendy and Ramona appear to be equally strong (value of .5). Bob and Ramona are similar, but Bob is slightly stronger than Ramona (.55 value).

The leadership matrix is a fuzzy relation matrix. Procedures for the analysis of such matrices have been developed by Bezdek, Spillman and Spillman (1978). Since the mathematical theorems have been proven and explained elsewhere, only a short review of the most relevant equations will be presented.

Given a leadership matrix R, a scaler measure of the amount of fuzziness in a matrix can be calculated using the following equation:

$$F(R) = \frac{2\,tr(R^2)}{n(n-1)}$$

n = number of members in the group

$tr \equiv$ trace of the matrix

F(R), the fuzzy measure ranges from 0.0 to 1.0. The maximum amount of fuzziness in the matrix is 1.0 and 0.0 is the minimum. For our purposes, a 0.0 will correspond to a group where a single leader emerged and other members did not perform leadership functions. A 1.0 will indicate that all members were completely equal in the performance of leadership functions. These numbers, of course, result from the perceptions of all group members. For the sample matrix, F(R) is:

$$F(R) = \frac{2(.826)}{3(2)} = .275$$

Taking the sum of the columns in the leadership matrix, one can determine the hierarchical structure of leadership. Since each column represents a member of the group, the higher the sum of the entries, the higher the individual's leadership rating relative to other group members. In the sample matrix, column sums are:

Bob .75
Wendy 1.3
Romano .95

To remove the dependence of the column sum (leadership strength rating) upon the number of members in a group, column sums are divided by the number of group members minus 1. This procedure generates a measure of leadership strength that ranges between 1.0 to 0.0. A strong leader might receive a rating of 1.0 while a nonleader might receive a rating of 0.0. For the sample matrix, then, the final leadership hierarchy is:

Wendy .65
Ramano .475
Bob .375

III. A Pilot Test of the Leadership Matrix Efficacy

Subjects

Students enrolled in communication fundamentals courses during winter quarter, 1978, participated in this study as part of their class decision making project. Seven groups of 5 Ss and one group of six Ss participated. All students had read material and heard informational lectures on group decision making before participating in their class project. Leadership was only one of the many variables discussed.

Procedure

Ss met in their group for five days in class. Some met one time outside class as a voluntary method for completing the group decision proposal by the assignment due date. One day after the completion of their decision making tasks, all students filled out a communication critique which asked them to evaluate and describe their group interaction and productivity. The relevant questions on the communication critique for this study was the following: "Who was or were the leaders in your group: task and social? What did these people do in your group discussion that leads you to your conclusions?"

Simultaneously Ss filled out two leadership matrices: one for task leaders and the other for social leaders. Traditional definitions of task leadership were offered in the instructions. Task leadership was defined as, "...such functions as gathering information, summarizing ideas, suggesting information and opinions, organizing ideas, helping with the division of labor, etc." Social leadership was defined as "promoting group cohesiveness, resolving interpersonal tensions, supporting group identification and encouraging member participation, and making people feel comfortable in group meetings."

Results

The fuzziness of each leadership matrix was calculated. The leadership hierarchy was determined by summing columns according to the procedures outlined. Answers to the leadership question on the communication critique were analyzed to determine the names of the people in the groups who were perceived as task or social leaders. For the purposes of this pilot study we concentrated only on those people labelled task or social leaders by the majority of group members. This analysis was intended to determine whether results from the leadership matrices correlated with the results from the open-ended self-report question.

If these two questions provided similar information and conclusions, it would provide evidence that the leadership matrices are indeed tapping the leadership hierarchy which they are designed to measure.

Our assumption that group leadership is shared was supported by the data from both the task and social matrices (see Table 1). The range of fuzziness or agreement among individuals on the leadership structure for the task dimension was from 1249 indicating a more central leadership structure to .637 indicating a more diverse or shared leadership emergence. On the social dimension, the results ranged from .151 indicating relatively high agreement on a few social leaders to .586 indicating a differentiated hierarchy of social leadership.

The findings from the fuzziness calculations were congruent with the results of the leadership questions. Every member of the groups contended that leadership was shared. Some members refused to name specific leaders and others asserted that naming leaders was difficult for them. Statements along these lines included the following: "Our group didn't really have a true leader. We all took responsibility for carrying out our jobs," and "I can't really name specific persons who were leaders in our groups. We all were." Other members named specific people who carried out leadership functions, but also asserted that leadership was a decentralized or shared phenomenon. Statements reflecting this evaluation included: "If I had to name a leader, Matt would be the most important task leader. He got us going and helped us decide who to interview and what to research. We all took on our responsibilities, however, and leadership changed throughout our meetings." And "Several people emerged as task and social leaders in our meetings. Different people took charge on different days throughout our project and everyone got involved. No one took a free ride and just depended on others to do their jobs."

The hierarchical development of leadership through the assessment of leadership strength across individuals also revealed that leadership is a shared phenomenon (see Tables 2 and 3). The circled entries in Tables 2 and 3 correspond to the members choser most often as leaders by group members on the leadership question. There was an extremely close correspondence between the matrix hierarchy and the most-often labelled leader in the leadership question. In five of the eight groups, the strongest perceived leaders as indicated by the summated column score on the matrix was identical with the person most often labelled task leader in the questionnaire. In two groups the second strongest perceived leader was the person most identified as leader on the questionnaire. In the last group the third strongest perceived leader was the person labelled as leader most often by the open-ended questions. While there was some discrepancy, then, in the two measurement systems, the average difference between the leadership strength score for the strongest leader and the leadership strength for the person chosen in the questionnaire was only .05. Flipping the coin, none of the people who were dismissed as leaders in the questionnaire demonstrated strong leadership strength on the fuzzy leadership matrix. Thus, the matrix provided a viable method for determining a hierarchy of perceived leadership in small group decision making.

Analysis of the social leadership dimension was stymied because most Ss did not label social leaders for their group in the leadership question. A validity check on the social matrices, therefore, was impossible to calculate.

That individuals exhibited different degrees of leadership when compared with other group members was also illustrated by results on the task and social matrices. Whereas rank ordering procedures provide only an irdinal ranking of the group members, clustering or variability of perceived leadership strength

can be detected through the fuzzy matrix analysis. Group two on the task dimension, for example, showed a clustering of perceived strengths indicating a relatively flat or egalitarian leadership heirarchy. The range of perceived leadership strengths for this group was from .585 to a low of .463, a difference of only .12. Group seven on the social dimension, on the other hand, demonstrated a more centralized social leadership structure with a range from .74 to .22, a difference of .52.

Similarly, one can detect the differences between the strongest, second strongest, third strongest leaders and so on throughout all the groups on the two dimensions. For example, two groups demonstrate extremely close leadership strength scores for task leaders between the first and second strongest persons in the leadership hierarchies. They differ by only .002 in both cases. On the social dimension for group 8, the smallest difference between first and second strongest perceived leaders was also only .002, indicating near equality. The difference between the first and second strongest leaders on the social dimension for group one, however, demonstrated a larger discrepancy in peer evaluation. The difference here is .18. Thus, much more information is gained through the fuzzy matrix technique than would be gained by ranking procedures.

Extending this line of thought, the matrix procedure also allows for a more precise comparison of perceived leadership strength across groups than does the ranking procedure. While a ranking procedure allows one to identify the strongest perceived leaders in all groups, it does not offer information about the actual leadership perceptions and strength of leadership across these first place comparisons. The matrix procedure allows such a comparison. In group seven on the social dimension, for example, the strongest perceived leader received a .74 rating. In group eight, however, the strongest perceived

leader received only a .585 rating, a difference of .155. On the task dimension, the strongest perceived leader received a .698 rating. In group seven on the task dimension, the strongest perceived leader received a .698 rating while the strongest perceived leader in group five only received a .55 rating, a difference of .143. Again, more information is gained through these procedures than would be gained by other leadership identification techniques.

Summary

The purpose of this paper was to report some preliminary findings concerning the utility and validity of a new fuzzy matrix procedure for the measurement of leader emergence and hierarchical structure. The instrument was designed to reflect the interactive, perceptual, and shared nature of leadership which has been advocated by many researchers. Several other measurement techniques were reviewed, but problems were found to be inherent both conceptually and methodologically with most existing measuring procedures. Results from a pilot test were explored to demonstrate the utility of the fuzzy matrix procedure. Several advantages accrue from the use of this new instrument: (1) Since it requires a paired comparison of perceived leadership strength among all group members, it captures the interactive nature of leadership. (2) Since it requires Ss to quantify their perceptions, of leadership, the instrument not only captures the importance of perception as it relates to behaviors performed by leaders, but offers data which can be easily manipulated by sophisticated mathematical techniques. (3) The method offers several significant advantages over the rank order measurement procedure: (a) It allows a cross group comparison and adds a depth of meaning to the rankings for first, second, third place and so on; (b) It provides information

concerning the distances between member ratings within a group; and (c) It provides a method for determining the egalitarian or centralized structure of leadership which is not attainable through the examination of rank orderings alone.

Several possible lines of research are suggested by this pilot study. First, leadership matrix analysis can be combined with both a thorough content analysis of Ss self-reports in open-ended question format and interaction analysis designed to reveal behaviors which are associated with perceived leaders. Second, leadership matrix analysis can be combined with the analysis of consensus and coalition formation to determine the interrelationships between these three important small group variables. Third, more sophisticated mathematical analyses can be used to provide even more information concerning the intricacies of the matrices revealed by this type of data collection. Work is presently being undertaken in all three areas.

REFERENCES

Bales, R. & Slater, P., "Role Differentiation in Small Decision Making Groups," in T. Parsons, et. al., Family, Socialization, and Interaction Process, (Glence, Ill.: Free Press) 1955.

Bezdek, J., Spillman, B., and Spillman, R., "A Fuzzy Relation Space for Group Decision Theory," International Journal of Fuzzy Sets and Systems Theory (in press).

Fisher, B.A., Small Group Decision Making: Communication and the Group Process, (New York: McGraw Hill) 1974.

Gouran, D.S., "Variables Related to Consensus in Group Discussions of Questions of Policy," Speech Monographs, 36(1969), p. 387-391.

Katz, R., "The Influence of Group Conflict on Leadership Effectiveness," Organizational Behavior and Human Performance, 20(1977), p. 265-286.

Keely, B., "Orientation and Leadership: A Possible Causal Relationship," presented at WSCA, Seattle, Nov. 1975.

Lashbrook, Velma, "Leadership Emergence and Source Valence: Concepts in Support of Interaction Theory and Measurement," Human Communication Research, 1(1974), p. 308-315.

Lashbrook, Velma and Lashbrook, William, "Toward the Theoretically Based Measurement of Small Group Leadership," presented at WSCA, Seattle, Nov. 1975.

Marak, G.E., "The Evolution of Leadership Structure," Sociometry, 27(1964), p. 174-182.

Scioli, F.P., Dyson, J.W., and Fleitas, D.W., "The Relationship of Personality and Decisional Structure to Leadership," Small Group Behavior, 5(1974), p. 3-22.

Spillman, B., Spillman, R., and Bezdek, J., "A Dynamic Measurement of Consensus in Small Decision Making Groups," presented at SCA, Washington, D.C., Dec. 1977.

Spillman, B., Spillman, R., and Bezdek, J., "New Methodologies for Communication Research: Application of Fuzzy Mathematics," presented at WSCA, Phoenix, Nov. 1977.

Spillman, B., Bezdek, J., and Spillman, R., "Development of an Instrument for the Dynamic Measurement of Consensus," Communication Monographs, (in press).

Stein, R.T., Geis, F.L., and Damarin, F., "Perception of Emergent Leadership Hierachies in Task Groups," Journal of Personality and Social Psychology, 28(1973), p. 77-87.

Stein, R.T., "Identifying Emergent Leaders from Verbal and Nonverbal Communications," Journal of Personality and Social Psychology, 32(1975), p. 125-135.

Zadeh, L.A., "Fuzzy Sets," Information and Control, (1965), p. 338-353.

	1	2	3
1	0	$1-r_{21}$	$1-r_{31}$
2	r_{21}	0	$1-r_{32}$
3	r_{31}	r_{32}	0

FIGURE 1: SAMPLE LEADERSHIP MATRIX

Note: The diagonal entries are 0 and $r_{ij} + r_{ji} = 1$

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	Bob	Wendy	Ramona
Bob	0	.8	.45
Wendy	.2	0	.5
Ramona	.55	.5	0

FIGURE 2: FUZZY LEADERSHIP MATRIX

Task	Social
.6	.586
.551	.151
.574	.574
.249	.58
.606	.58
.501	.507
.237	.125
.637	.511

TABLE 1: GROUP FUZZINESS

Leader Ranking	Task Group 1	2	3	4	5	6	7	8
1	.65	.585	.575	.633	.555	.63	.698	.598
2	.598	.5	.573	.558	.553	.588	.64	.553
3	.478	.483	.525	.528	.548	.54	.624	.523
4	.43	.47	.488	.435	.518	.428	.406	.37
5	.345	.463	.34	.35	.328	.315	.334	.339
6	—	—	—	—	—	—	.302	—
Group Fuzziness	.6	.551	.574	.249	.606	.501	.237	.637

TABLE 2: TASK LEADERSHIP VALUES

Leader Ranking	Social Group 1	2	3	4	5	6	7	8
1	.693	.625	.61	.62	.648	.643	.74	.585
2	.51	.585	.565	.568	.495	.523	.606	.583
3	.47	.58	.513	.498	.485	.523	.586	.495
4	.44	.428	.475	.418	.465	.513	.464	.47
5	.388	.283	.343	.398	.408	.3	.388	.368
6	—	—	—	—	—	—	.22	—
Group fuzziness	.586	.151	.574	.58	.58	.507	.125	.511

TABLE 3: SOCIAL LEADERSHIP VALUES